



California Energy Commission

Developing Biomass Energy in California

Seventh Annual Biomass Collaborative Forum

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Existing Bioenergy Goals

- Policy Drivers:
 - Renewable Portfolio Standard - AB 32
 - Integrated Energy Policy Report (IEPR)
- Gov's Exec Order S-06-06 Bioenergy
 - 20% of the RPS by 2010 and 2020 / **Biopower: Electricity**
 - 3,300 GWh additional biopower generation by 2010
 - 10,000 – 13,000 GWh additional biopower generation by 2020
 - In-state biofuels: 20% by 2010; 40% by 2020/**Tran. Fuels:Liquid;Gaseous**
 - 100 million GPY by 2010
 - 550 million GPY by 2020
- How Are We Doing to Meet These Goals?



Sources of Biomass

Forest

Forest Residues
Pulp Waste
Tree Thinning

Urban

Green Waste
Wood Waste
Food Waste
Sludge
Garbage-
Post recycled

Agriculture

Field Waste
Food Pro-
cessing
Dairy Waste
Ag Crops



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Biomass Solid Fuel Biopower Plants Developed in California

Year of Construction	# of Total Facilities Constructed	# of Facilities Currently Operating	MW Capacity of the Total Facilities Constructed	MW Capacity of Facilities Currently Operating
1980s or before	53	22	759	474
1990s	13	7	199	179
2000s	1	1	36	14
Total	67	30	994	667

Data Source: Dr. Gregory Morris, Future Resources Associates, Berkeley, CA



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MSW Incineration Power Plants Developed in California

Year of Construction	# of Total Facilities Constructed	# of Facilities Currently Operating	MW Capacity of the Total Facilities Constructed	MW Capacity of Facilities Currently Operating
1980s or before	3	3	70	70
1990s	0	0	0	0
2000s	0	0	0	0
Total	3	3	70	70

Data Source: California Energy Commission



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Landfill Gas to Electricity Biopower Plants Developed in California

Year of Construction	# of Total Facilities Constructed	# of Facilities Currently Operating	MW Capacity of the Total Facilities Constructed	MW Capacity of Facilities Currently Operating
1980s or before	43	24	170	127
1990s	24	19	84	72
2000s	51	47	126	110
Total	118	90	380	309

Data Source: US EPA Landfill Methane Outreach Program



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Livestock Manure Biogas Power Plants Developed in California

Year of Construction	# of Total Facilities Constructed	# of Facilities Currently Operating	MW Capacity of the Total Facilities Constructed	MW Capacity of Facilities Currently Operating
1980s or before	18	1	NA	0.03
1990s	0	0	0	0.00
2000s	18	4/5	3.8	0.90
Total	36	5/6	3.8	0.93

Data Source: California Energy Commission



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Ethanol Plants Developed in California

Year of Construction	# of Total Facilities Constructed	# of Facilities Currently Operating	Million gal/yr Capacity of the Total Facilities Constructed	Million gal/yr Capacity of Facilities Currently Operating	Feedstock Used
1980s	2	1	8.5	5	Beverage and cheese wastes
1990s	0	0	0	0	
2000s	5	1	239	53	Corn
Total	7	2	247.5	58	



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Resource and Market Potential for CHP From Wastewater and Co-Digestion From Other Biowastes in Megawatts

Resource Type	Technical Resource Potential (MW)	Market Potential (MW)
Wastewater	125	95
Restaurant Fat, Oil, and Grease	10	8
Food Processing Waste	129	97
Dairy Waste Manure	334	250
Combined Total	598	450

Source: Kulkarni, Pramod. 2009. Combined Heat and Power Potential at the California Wastewater Treatment Plants. California Energy Commission. CEC-200-2009-014-SF.

# of WWTP with potential for CHP	# of facilities with anaerobic digestion	# of facilities with CHP biopower	MW Capacity of Operating Facilities
268	117	74	35-66

Source: Kulkarni, Pramod. 2009. Combined Heat and Power Potential at the California Wastewater Treatment Plants. California Energy Commission. CEC-200-2009-014-SF.



How can we meet near term goals?

- Need additional 580 MW to meet 2010 biopower goal
- Need 100 MGPY additional in-state biofuel capacity to meet 2010 goal

How can we meet long term goals?

- Need 1,800 – 2,200 MW added capacity to meet 2020 biopower goals
- Need 500 MGPY additional in-state biofuel capacity